C 81760 (Pages : 3) Name.......................................

Reg. No.......................................

SECOND SEMESTER (CUCBCSS—UG) DEGREE EXAMINATION, APRIL 2020

B.C.A.

BCA 2C 04—NUMERICAL METHODS IN C

(2014 Admissions)

Time : Three Hours Maximum : 80 Marks

Part A (Objective Type Questions)

Answer **all** *questions.*
Each question carries 1 *mark.*

1. The number $\pi = 3.14159265......$ is approximated by $\frac{22}{7}$. Find upto how many digits is this approximation accurate.
2. If X = 2.536, find the relative error when X is truncated to two decimal digits.
3. Represent 44.85×10^6 in normalized floating-point mode.
4. State Newton- Raphson's formula.
5. Define the rate of convergence of an iterative method.
6. What do you mean by backward differences ?
7. Explain Gauss Elimination method briefly.
8. Write the formula obtained from Newton's forward interpolation for computing the value of $\frac{dy}{dx}$.
9. What do you mean by numerical integration ?
10. In solving $\frac{dy}{dx} = f(x,y), y(x_0) = y_0$, write down Taylor's series for $y(x_1)$.

(10 × 1 = 10 marks)

Part B (Short Answer Type)

Answer **all** *questions.*
Each question carries 2 *marks.*

11. Round-off the number 75462 to four significant digits and then calculate its absolute error, relative error and percentage error.
12. Find an interval of unit length which contains the smallest positive root of the equation $x^3 - 5x - 1 = 0$.

Turn over

13. Using Crammer's rule, solve the system $3x+y+z=3, 2x+2y+5z=-1$ and $x-3y-4z=2$.

14. Prove that $\delta = E^{1/2} - E^{-1/2}$.

15. Evaluate $\int_0^1 \frac{dx}{1+x^2}$ using Trapezoidal rule taking $h=\frac{1}{6}$.

(5 × 2 = 10 marks)

Part C (Short Essay Type)

Answer any **five** *questions.*
Each question carries 4 *marks.*

16. Approximate values of $\frac{1}{7}$ and $\frac{1}{11}$, correct to 4 decimal places are 0.1429 and 0.0909 respectively.

    Find the possible relative error and absolute error in the sum of 0.1429 and 0.0909.

17. Find a real root of the equation $x^3-2x-5=0$ by the method of false position correct to three decimal places.

18. Solve the system of equations $3x+y-z=3, 2x-8y+z=-5, x-2y+9z=8$ using Gauss elimination method.

19. Find the Lagrange's interpolation polynomial fitting the points

    $f(1)=-3, f(3)=0, f(4)=30, f(6)=132$. Hence find $f(5)$.

20. Find the missing term in the following table :

x	:	1	2	3	4	5	6	7
y	:	2	4	8	-	32	64	128

21. Prove the following :

    a) $\Delta = 1 - e^{-hD}$.

    b) $\mu^2 = 1 + \frac{\delta^2}{4}$.

22. From the following table of values of x and y, obtain $\frac{dy}{dx}$ for $x=2.2$.

x	:	1.00	1.20	1.40	1.60	1.80	2.00	2.20
y	:	2.7183	3.3201	4.0552	4.9530	6.0496	7.3891	9.0250

23. Find by Taylor's series method the value of y at $x=0.1$ correct to five places of decimals from $\frac{dy}{dx} = x^2y - 1, y(0) = 1$.

(5 × 4 = 20 marks)

Part D (Essay Questions)

Answer any **five** *questions.*
Each question carries 8 marks.

24. (a) How many digits are to be taken in computing $\sqrt{20}$, so that the error does not exceed 0.1%.

    (b) Find the product 349.1 × 863.4 and state how many figures of the result are trust worthy, assuming that each number is correct to four decimals.

25. (a) Find a real root of the equation $x^3 - x - 1 = 0$, that lies between 1 and 2, using bisection method.

    (b) Derive a Newton-Raphson iteration formula for finding the cube root of a positive number N and hence find $\sqrt[3]{24}$.

26. Solve the system of equations $x + 2y - z = 3$; $3x - y + 2z = 1$; $2x - 2y + 3z = 2$ by Gauss-Jordan method.

27. Derive Simpson's $(3/8)$-rule $\int_{x_0}^{x_3} y\,dx = \frac{3}{8}h\left(y_0 + 3y_1 + 3y_2 + y_3\right)$.

28. For the data :

x	:	0	0.2	0.4	0.6	0.8	1.0
$f(x)$	:	7.0	6.008	5.064	4.216	3.512	3.0

Find an approximation to $f(0.1)$ and $f(0.3)$.

29. Given $f(0) = -18, f(1) = 0, f(3) = 0, f(5) = -248, f(6) = 0, f(9) = 13104$, find $f(x)$.

30. Evaluate $\int_0^1 \frac{dx}{1+x}$, using Romberg's method.

31. Use Runge-Kutta method to find y when $x = 1.2$ in steps of 0.1 given that $\frac{dy}{dx} = x^2 + y^2$ and $y(1) = 1.5$.

(5 × 8 = 40 marks)